Marshall Electronics

VS-101-HDSDI
H.264 HD Video Server

User Manual Ver. 1.0.2

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Table of Contents

Table of Contents

Safety Precaution

> We appreciate your purchase of the VS-101-HDSDI.
> Before installing the product, please read the following with care.

- ■ **Make sure to turn off the power before installing VS-101-HDSDI.**

- ■ **Do not install in locations with direct sunlight or in dusty areas.**

- ■ **Make sure to use the product within the temperature and humidity specifications.**

- ■ **Do not operate the product in locations with strong vibrations or magnetic fields.**

- ■ **Do not insert electrically conductive materials in the ventilation hole.**

- ■ **Do not open the product. There are no user serviceable parts inside.**

- ■ **To prevent from overheating, make sure to keep a clearance of at least 4 inches from the ventilation hole.**

- ■ **Make sure the voltage is correct (220V/110V) before connecting the power.**

Introduction

About This Manual

This User Manual provides information on operating and managing the VS-101-HDSDI. The Manual includes instructions for the installation, operation and configuration of the VS-101-HDSDI as well as troubleshooting tips.

Features

VS-101-HDSDI is a Video and Audio transmission system that provides HD Video and AAC audio along with remote functions using IP protocol through existing LAN, ADSL/VDSL, and Wireless LAN networks. When encoding the VS-101-HDSDI compresses video and audio data and transmits it. When Decoding the VS-101-HDSDI receives the data and decompresses it.

■ **Video**
- **State-of- the art H.264 & MJPEG Compression Algorithm.**
- **Compression and Decompression with 18 Resolution formats.**
- **: Full HD (1920x1080) ~ CIF(352x240)**
- **Wide Range of Video Transmission Rate : 32kbps ~ 8Mbps**
- **Various Transmission Mode : CBR, VBR**
- **Motion Detection**
- **HDMI In/Output**
- **HD-SDI In/Output**

■ **Audio**
- **Multi-Transmission Mode : Unidirectional or Bidirectional stereo audio**

■ **Network**
- **Static IP & Dynamic IP (DHCP) Support**
- **One to One Connection & One to Multiple Connection**
- **Multi-Casting**
- **Various Protocols support : TCP/IP, UDP, Multicast, DHCP, SMTP, HTTP, SNMP, RTP, RTSP**

■ **Serial Data**
- **Two serial ports : RS-232, RS-422/485**
- **Various PTZ camera protocols**
- **Data pass-through mode : Serial data communication between Encoder - Decoder**

Introduction

- **Sensor and Alarm**
  - **Connections to external sensor and alarm devices**
  - **Event Alarm**

- **USB**
  - **Connection to an external USB storage for remote access, recording and playback**

- **User Interface**
  - **Display system status with OSD (On Screen Display)**
  - **Configuration and upgrade using dedicated program (True Manager)**
  - **System configuration using Internet Explorer**

- **Reliability**
  - **Reliable embedded operating system**
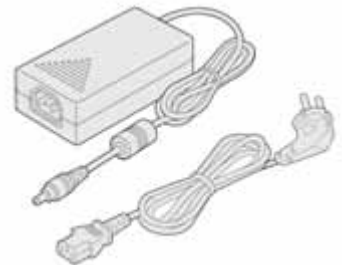 - **Auto reboot and system recovery after power loss**
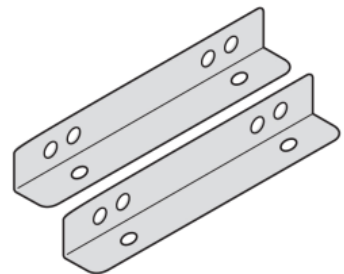
Product and Accessories

VS-101-HDSDI

User Manual

Power adapter and Cable

Software CD

Screws

Brackets

Introduction

Part Names and Functions

■ **Front View**
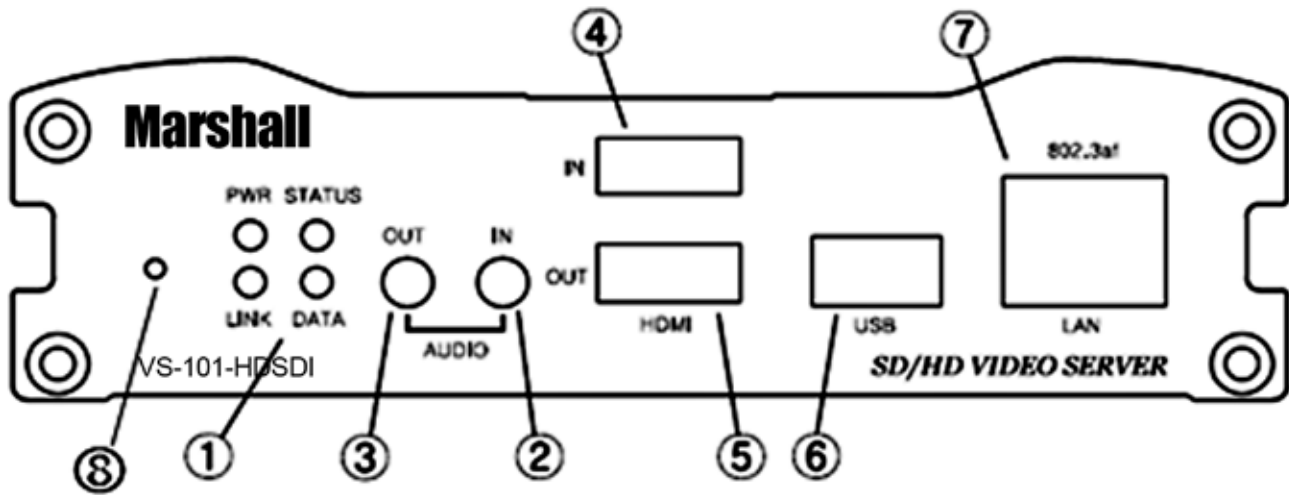
No.	Parts	Function
1	LED	Display system status
2	Audio Input	Audio Input
3	Audio Output	Audio Output
4	HDMI Input	HDMI Video Input
5	HDMI Output	HDMI Video Output
6	USB Port	USB 2.0
7	LAN	100/10-base-T Ethernet
8	Reset Button	Initialization of network setting

Introduction

■ **Rear View**

No.	Parts	Function
1	Power	DC +12V power input
2	Sensor	Sensor Input
3	Alarm	Alarm or Relay Output
4	RS-422/485	Serial port for PTZ control and etc
5	RS-232	Serial port for PTZ control and etc
6	Video Output	Composite or HD-SDI Output
7	Switch	Composite or HD-SDI Switch - Switch Down: Composite Video - Switch Up : HD-SDI Video
8	Video Input	Composite or HD-SDI Input
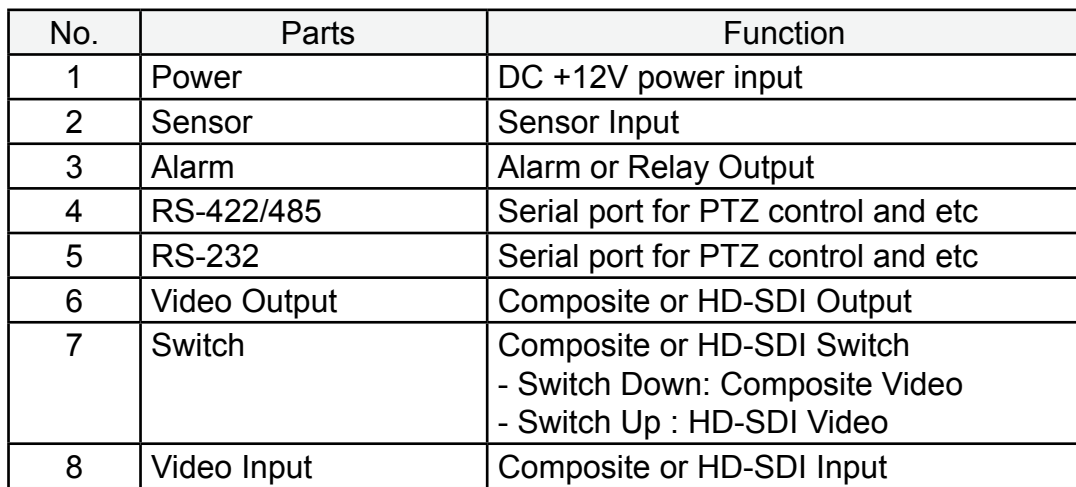
Introduction

System Modes and Connections

The VS-101-HDSDI operates as an Encoder or Decoder. The VS-101-HDSDI can be connected in either 1-to-1 fashion where one encoder is connected one decoder or 1-to-many fashion where one encoder is connected to many decoders.

Following chart shows data status of video, audio and serial data on each mode.

System Mode	Video	Audio	Serial Data
Encoder	Transmit	Transmit/Receive	Transmit/Receive
Decoder	Receive	Transmit/Receive	Transmit/Receive

The System Mode is determined by the video communication status, while Audio and Serial Data modes are always capable of Unidirectional or bidirectional transmission.

■ **Topology**

Generally, the encoder and decoder are connected in 1-to-1 mode. To support specific situations, 1-to-1 multiple connections are also supported.

▪ **1:1 Connection (Unidirectional Transmission)**
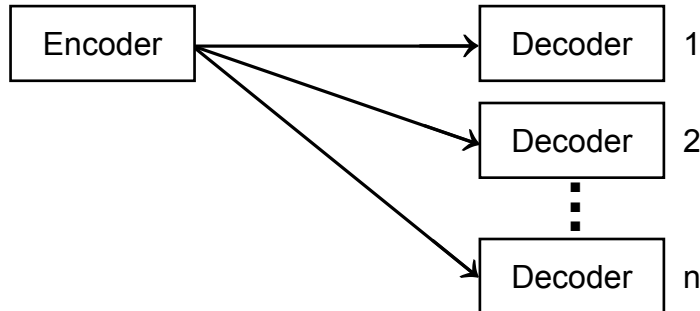
Site   Remote Center
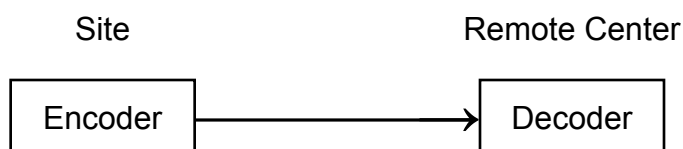
Encoder ⟶ Decoder

Mostly used configuration is 1 to 1 connection. An encoder is installed at a site where video images can be transmitted and a decoder is installed at a center location to receive and view the video images on monitors. Audio and serial data are transferred in either direction.

A decoder and encoder can be connected by setting the encoder's address at the decoder's remote IP.

Introduction

■ **1:N Connection (Unidirectional Transmission)**

```
                                    ┌──────────┐
                            ┌──────→│ Decoder  │  1
                            │       └──────────┘
┌──────────┐                │       ┌──────────┐
│ Encoder  │────────────────┼──────→│ Decoder  │  2
└──────────┘                │       └──────────┘
                            │            ·
                            │            ·
                            │       ┌──────────┐
                            └──────→│ Decoder  │  n
                                    └──────────┘
```
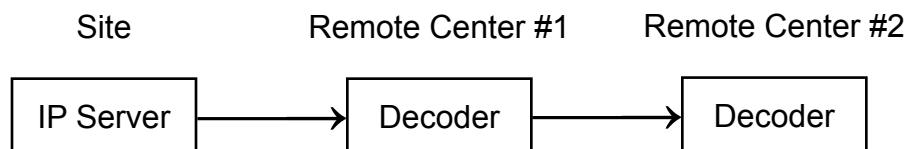
In this configuration, a site can be monitored from many remote center locations. Although up to 'n' decoders can be connected to an encoder, in the real network environment, Maximum connections would be limited by network bandwidth connection

Functionally, the CMS (Central Monitoring System) software can replace the decoder.

Multicast Mode

In the network supporting multicast mode, if Multicast is setup as a system protocol, you can use bandwidth efficiently regardless of the number of decoders. In 1:N connection, a large number of decoders can receive audio and video data from an encoder by using a single streaming transmission.
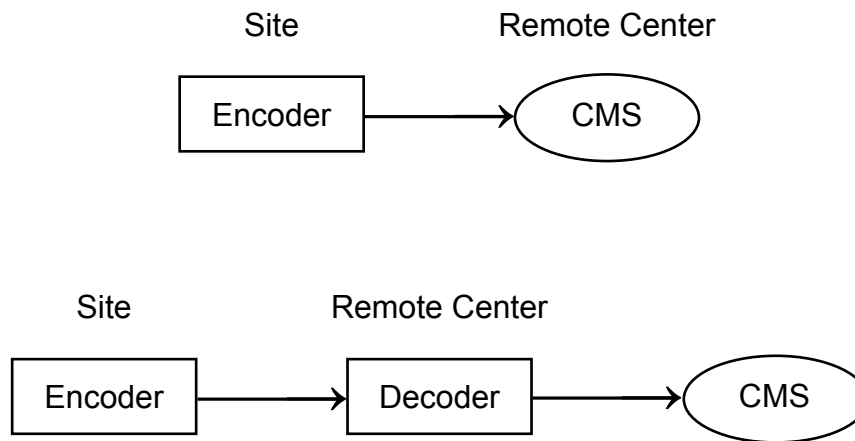
■ **Relaying**

```
        Site            Remote Center #1      Remote Center #2

   ┌──────────┐          ┌──────────┐          ┌──────────┐
   │IP Server │────────→ │ Decoder  │────────→ │ Decoder  │
   └──────────┘          └──────────┘          └──────────┘
```

In this arrangement, video and audio can be retransmitted from a center to another center. The arrangement is useful when the network bandwidth at the site is limited while there is more than one center wanting to monitor the site.

Introduction

■ **CMS(Central Monitoring System)**

```
     Site              Remote Center

  ┌──────────┐           ╭───────╮
  │ Encoder  │─────────▶ │  CMS  │
  └──────────┘           ╰───────╯


     Site              Remote Center

┌──────────┐      ┌──────────┐         ╭───────╮
│ Encoder  │────▶ │ Decoder  │───────▶ │  CMS  │
└──────────┘      └──────────┘         ╰───────╯
```

CMS (Central Monitoring System) is a Windows based remote monitoring program to access multiple encoders for real-time monitoring or control of the encoders and connected cameras. Please refer to CMS User Manual for more information on CMS.

Installation

Connecting Video

- **Encoder System**
    - **Connecting the HD Camera**
      Connect the HDMI or HD-SDI output of the HD camera to the Appropriate HDMI or HD-SDI Input port of VS-101-HDSDI. For HD-SDI the input dip switch should be set to the UP position

    - **Connecting a standard resolution NTSC/PAL Camera**
      Connect the camera to the Video Input port of the VS-101-HDSDI. For standard NTSC/PAL the video input dip switch should be set to the Down position.

- **Decoder System**
  Connect a monitor to the HDMI or COMPOSITE (HD-SDI) Output of the VS-101-HDSDI.

Connecting Audio

Audio is bidirectional regardless of the system mode (Encoder or Decoder).
If necessary, it can be configured to be transmit-only, receive -only or bidirectional mode

- **Connect the audio input and output ports to the appropriate audio devices as required.**
- **The Audio I/O is -10dBu unbalanced line level stereo, appropriate microphone or speaker amplification is required.**

Connecting Serial Ports

Two serial ports are provided for remote camera control and PTZ controller receiver. These are connected in connected in 1-to-1 fashion and work in a pass-through mode. This means that commands at a local system's COM1 port will be transparently passed to the remote system's COM1 port. Also, a command at a local system COM2 port will pass to the remote system's COM2 port.

Connecting Sensor and Alarm

Connect sensor and alarm devices to corresponding terminals as required.

Installation

Connecting Power

After confirming the power source, connect power adaptor and connect the 12VDC connector to the VS-101-HDSDI. The system will begin to boot up to the operating mode.

Check if it Works

Once the power is supplied to the server, it will start booting. The system will boot up to an operating mode after approximately 40-60 seconds. The green LED on the Ethernet port will flash indicating the system is ready.

Software provided on the disc called True Manager allows you to check the IP address and other network details of the server. Please refer to the True Manager manual for instructions on how to find the IP address of the server and if required changing it.

■ **Encoder LED Display**

PWR	STATUS	LINK	DATA
○	○	○	○
Red	Green Blinking	OFF	OFF

Above LED status shows that the server is connected but a decoder is not connected. Once the encoder is connected to a decoder, color of "LINK" LED will turn into green color and " DATA" LED will blink as video and / or audio transmissions occur.

■ **Decoder LED Display**

PWR	STATUS	LINK	DATA
○	○	○	○
Red	Green Blinking		OFF

Above LED status shows that the Decoder has started without connecting to an encoder. Once an encoder is connected, the color of "LINK" LED will be turned to green and the "DATA" LED will blink as video and / or audio data transmissions occur.

System Operation

■ **Description of LED**

LED	State	Description
PWR	Off	Power off
	Red	Power on
STATUS	Green blinking	Normal operation
	Red	System failure: Needs diagnostics
	Constant change of colors between Red and Green	NTSC/PAL setting does not match with input video signal
	Red blinking	Failed to obtain IP address in DHCP mode
	Constant change of colors between Green blinking 2 times and Red blinking once	Failed to register on DDNS server
	Green blinking, Red blinks once every 5 seconds	Video loss in Encoder system
	Constant change of colors : Green, Orange, Red color in turn	Formatting USB storage device
LINK	Off	No connection to remote system
	Green	Connected to a remote system
	Red blinking	Decoder only: trying to connect to an Encoder
	Orange	Illegal connection (unsupported combination of system modes)
DATA	Green	Data transmission in progress
	Red	Data loss
	Off	No data transmission

System Operation

Remote Video Monitoring

There are two ways to view video when the connections are completed between a site and center system. In order for a proper operation, an IP address must be set accordingly. Please refer to True Manager in Chapter 3 or Remote Setting in Chapter 4 for further details.

Default ID : admin	Default Password : 1234

■ **Video Monitoring with Decoder System**

Once the IP address is set in the remote IP address section of the decoder, the decoder system will connect to the encoder systems and start receiving the video images. A monitor must be connected to the decoder in order view the video images.

■ **Video Monitoring using Internet Explorer**

Open Internet Explorer and enter the encoder's IP address. The system will ask for confirmation to install Active-X control. Once authorized, the Internet Explorer will start to display video images from the encoder in the Live View window as shown.

Default IP Address : http://192.168.10.100

System Operation
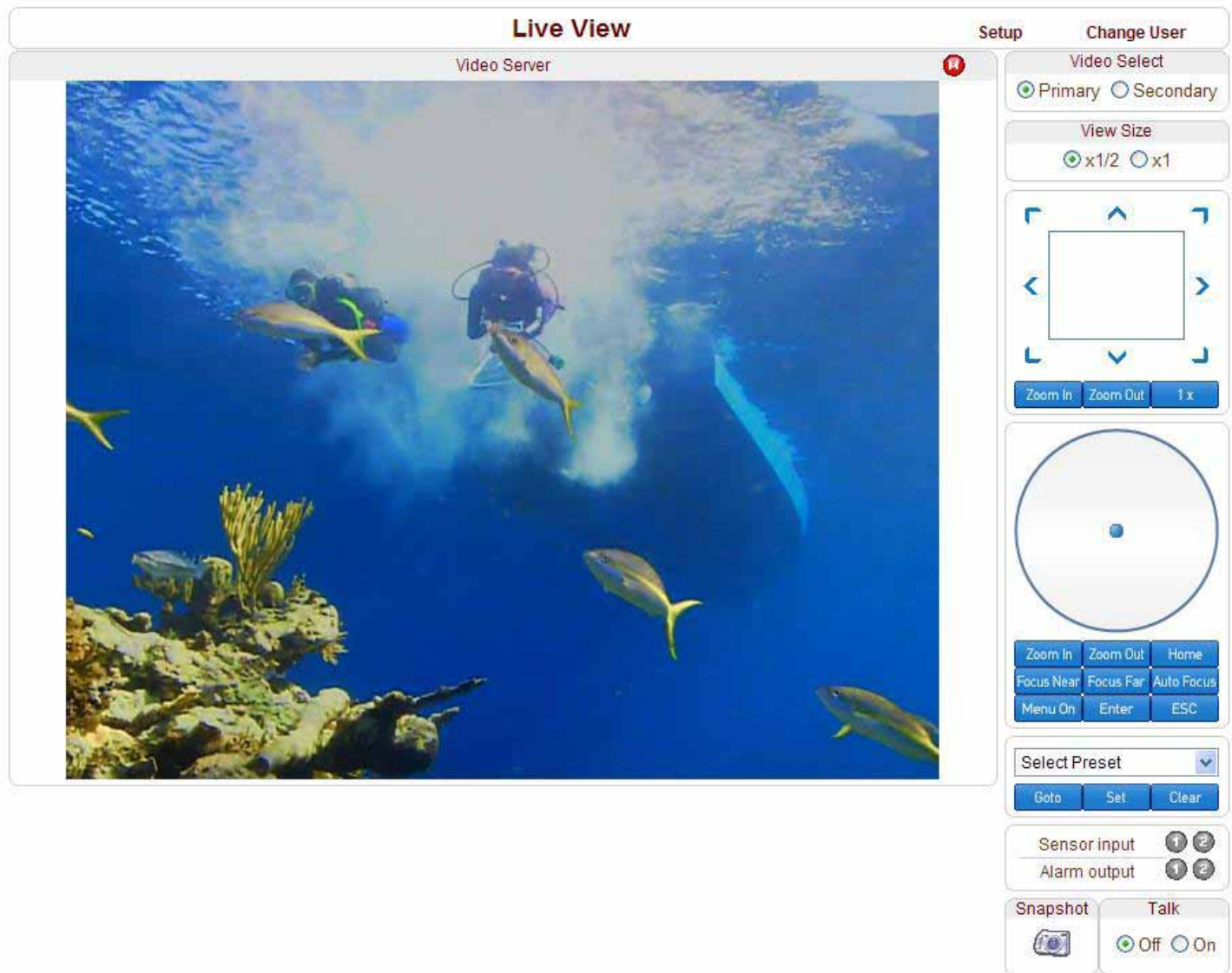
- ■ **Video Selection**
    The VS-101-HDSDI is capable of dual streaming. Video Selection allows you to choose Primary Video image or Secondary Video image. Video Image is displayed according to the resolution set in video configuration. When dual streaming is not activated and secondary mode is selected, video will not be displayed.

- ■ **Screen Size : Adjust screen size**

- ■ **Digital Zoom**
    Max 5x Digital Zoom is available
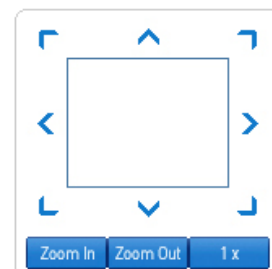
System Operation

- **Focus Near, Focus Far, Auto Focus**

    Adjust the focus

- **Sensor Input**

    When the sensor on VS-101-HDSDI is triggered, the light turns red.

- **Alarm Output**

    Indicates the alarm device connected to VS-101-HDSDI is active.

- **Screen Capture (Snapshot)**

    Capture pictures and store as BMP or JPEG files.

- **Audio Transfer (Talk)**

    Transfer audio

Initialization of IP Address

If a VS-101-HDSDI IP address is lost, the unit can be reset to the factory default IP address using the reset button in the back side of the system.

1. While the VS-101-HDSDI is powered, press the reset button and hold for 5 seconds.
2. The system will reboot automatically
3. Once the VS-101-HDSDI reboots the IP address will reset to the system default as below.

IP mode	Fixed IP	IP address	192.168.10.100
Subnet mask	255.255.255.0	Gateway	192.168.10.1
Base port	2222	HTTP port	80

Remote Configuration

Remote Configuration

Remote configuration of the server is available by web browser. Enter IP address of the VS-101-HDSDI when the live view screen appears as below, Press the Setup button in the screen to set the server.

For Remote Setting, the user must be authorized higher than manager level.
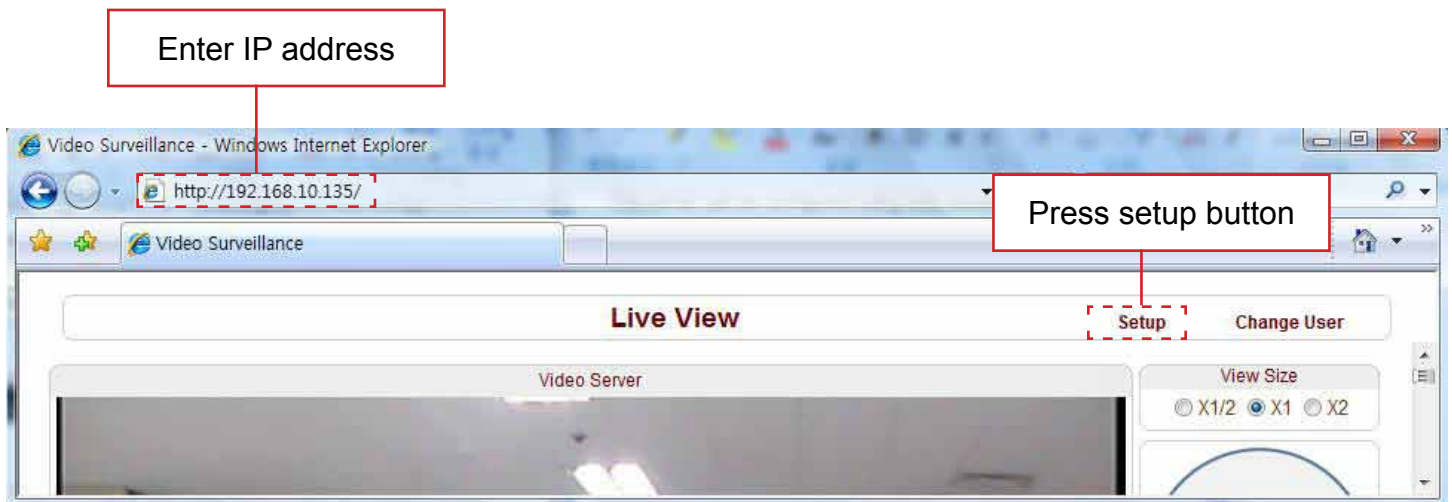
The remote configuration window may be slightly different depending on the system modes (Encoder, Decoder). The general explanation of the configuration in this manual is based on Encoder system and differences according to the modes will be clarified when needed.

The configurations are grouped into 9 categories: System, Video, Audio, Network, Serial, Event, Preset, Record and User. Any configuration changes are not applied until Apply button is pressed. Leaving the page without pressing Apply button, any changes in the page will be discarded.

Encoder Configuration

Encoder Configuration

While most configuration items are common for Encoder and Decoder mode, there are items which are relevant to specific system mode. All the configuration items for Encoder mode are explained first. Then, items specific only to Decoder mode are described. The sections for Decoder will not include items are common to Encoder mode .

System Configuration

Encoder Configuration

- **General**
  - **System Mode**

    Select system Mode: Sets the VS-101-HDSDI to be an Encoder or Decoder.
  - **System ID**

    Sets the VS-101-HDSDI ID (Name). The name set is displayed with the video image in the web browser and remote decoder. This is useful to quickly identify feeds from Studio One or another camera in the facility.
  - **Language**

    Select the language to be used for web-based configuration

- **Firmware**
  - **Firmware version**

    Current firmware version
  - **Upgrade**

    After selecting a firmware file in your computer, upgrade the VS-101-HDSDI with the selected firmware file.

- **Time**
  - **Start Time**

    Latest system boot date and time
  - **Current Time**

    Current date & time: Enter a new date and time and press Set Current Time button to update date & time
  - **Time Zone**

    Select time zone of where the system is installed. Depending on the time zone, Daylight Saving Time is adjusted automatically

    The current time will be displayed on remote software and recording files according to the selected time zone, not the time set on the remote computer.

.

A time zone is a region of the earth that has uniform standard time, usually referred to as the local time. By convention, time zones compute their local time as an offset from UTC (Coordinated Universal Time). In casual use, GMT (Greenwich Mean Time) can be considered equivalent to UTC. Local time is UTC plus the current time zone offset for the considered location.

Encoder Configuration

- **Automatically synchronize with NTP server**

  Synchronize system time with an NTP server using NTP (network time protocol). Name of the NTP server should be registered on NTP server Name.

  > The Network Time Protocol (NTP) is a protocol for synchronizing the clocks of computer systems over packet-switched, variable-latency data networks. It is designed particularly to resist the effects of variable latency by using a jitter buffer.

- **Reboot**
  - **Reboot Server**

    Pressing Reboot Server button will cause the system to reboot. Do not press the Reboot button unless the server needs a reboot.

- **Factory Reset**
  - **Factory Reset**

    Set all settings to the factory default values. System log and user registrations are also cleared.

Encoder Configuration

Video Configuration

Encoder Configuration

- **Encode**

    - **Input Format**
    Select an Input Format. There are three types of input ports;
    Composite, HD-SDI, HDMI. Select an input format according to the input port type.

    ```
    Composite PAL
    Composite NTSC
    HD-SDI 1080i60
    HD-SDI 1080i50
    HD-SDI 720p60
    HD-SDI 720p50
    HDMI 480p30
    HDMI 480p60
    HDMI 576p50
    HDMI 720p25
    HDMI 720p30
    HDMI 720p60
    HDMI 1080p25
    HDMI 1080p30
    HDMI 1080i60
    HDMI 1080i50
    HDMI 720p50
    HDMI 1280x1024p30
    HDMI 1280x960p30
    HDMI 1024x768p30
    HDMI 1280x1024p60
    HDMI 1280x960p60
    HDMI 1024x768p60
    ```

    - **Resolution**
    Select video compression resolution. Compression resolutions are different depending on
    input formats. The scaling option is used when compression resolution is different from
    input compression. Without the scaling option, the input video image will be cut according to
    compression resolution. When scaling is selected, the input video size will be adjusted to the
    compression resolution.

    ```
    720x480
    720x240
    352x480
    352x240
    720x576
    720x288
    352x576
    352x288
    640x480
    800x600
    1024x768
    1280x960
    1280x1024
    1440x900
    1600x900
    1680x1050
    1280x720
    1920x1080
    ```

Encoder Configuration

- ▪ **Frame rate**

  Determine the maximum number of frames of video images to compress. The frame rate of actually transmitted video can be affected by the network bandwidth limitation

- ▪ **Preference**

  Preference in video compression and transmission: With 'Bit rate' selected, the video compression will be effected by the „Bit rate value entered. With 'Quality' selected, the video compression will be effected by the quality of image selected. Therefore, 'Bit rate' and 'Quality' corresponds to CBR (Constant Bit rate) and VBR (Variable Bit rate) respectively

- ▪ **Quality**

  Selectable video compression quality

  This selection is available if Preference is set to 'Quality'

- ▪ **Bit rate**

  Selectable video Bit rate.

  This selection is available if Preference is set to 'Bit rate'..

- ▪ **I-Frame Interval**

  Possible values between 0 and 255. There will be no I-frames if 0 is selected.

- ■ **Dual Encode**

  - ▪ **Use Dual Encode**

    The Selection between H.264 and MJPEG is supported. Secondary Video can be used on Live View window.

  - ▪ **Dual Compression Algorithm**

    Select Secondary Video compression between H.264 and MJPEG. Maximum resolution is 720 x 480. There are 8 steps for adjusting. If MJPEG is selected, only Quality mode is supported

- ■ **Motion Detection**
  - ▪ **Use Motion Detection**

    Select Motion Detection function

Encoder Configuration

- **Motion Detection Area Editing**

  Configure regions for motion detection. Regions of arbitrary shape can be configured by the following steps.

    1. Enable Edit item.
    2. Select editing Mode. Set is for including cells to motion detection region and Erase is for excluding.
    3. Select cells using the right button of the mouse. Multiple cells can be selected conveniently by press and dragging.
    4. Press Apply Edited Area to save the editing

- **Sensitivity**

  Set the condition to trigger an event for motion detection. The value determines the sensitivity of the motion detection within a block: the smaller, the more sensitive

- **Information Display**

  System ID and/or server time can be display over the video window in Internet Explorer. Each item can be turn on or off separately, and position also can be configure. This information is displayed after the video is decompressed

- **Burn-in OSD**

  Insert system ID and date/time in the compressed video. System ID and time respectively can be turned on or off in the video. And position and Font size can be selectable.

Encoder Configuration

Audio Configuration

- **Algorithm**
  - **Select audio algorithm between G.711 and AAC.**

- **Mode**
  - **Select audio operation mode**

Mode	Action
Off	No operation
Tx-Only	Transmit only
Rx-Only	Receive only
Tx & Rx	Transmit and Receive

- **Input Gain**
  - **Set audio input gain**

Encoder Configuration

| System | Video | Audio | Network | Serial | Event | Preset | Record | User |

Network

[Apply]

Local

IP Mode [Fixed IP ▼]

Local IP [192.168.10.108]

Local Gateway [192.168.10.1]

Local Subnet [255.255.255.0]

DNS

○ Obtain DNS server address automatically

◉ Use the following DNS server addresses

Primary DNS Server [0.0.0.0]

Secondary DNS Server [0.0.0.0]

Port

Base Port [2222]

HTTP Port [80]

RTSP Port [554]

RTSP Authentication

RTSP Authentication ◉ Off ○ On

SNMP

SNMP Listen port [161]

SNMP Trap Destination IP [0.0.0.0]

SNMP Trap Destination Port [162]

Multicast

Multicast IP [224.10.0.0]

DDNS

DDNS Server ◉ None ○ TrueDNS ○ DynDNS

☐ Check IP Disable

ID [   ]

Password [   ]

Domain Name [   ]

Bitrate Control

Flow Control Mode ◉ Frame Drop Mode ○ Suppression Mode

Address Information

Current IP 192.168.10.108

Current Domain Not RegisteredB

MAC Address 00:1C:63:A6:07:37

Connecting 1 :: 192.168. 10. 97 - (0,0)

Encoder Configuration

■ **Local**

▪ **IP mode**

Two IP modes are supported. Depending on the selected mode, further configuration items will be available as shown in the following chart.

IP Mode	Selection	Description
Fixed IP	Local IP	Fixed IP address
	Local Gateway	Gateway IP address
	Local Subnet	Subnet mask
DHCP	N/A	

If you are not familiar with IP addressing please ask your ISP provider or network manager for assistance setting the IP address information.

■ **DNS**

▪ **DNS**

Set DNS server IP address

The Domain Name System (DNS) is a hierarchical naming system for computers, services, or any resource connected to the Internet or a private network. It associates various information with domain names assigned to each of the participants. Most importantly, it translates domain names meaningful to humans into the numerical (binary) identifiers associated with networking equipment for the purpose of locating and addressing these devices worldwide. An often used analogy to explain the Domain Name System is that it serves as the "phone book" for the Internet by translating human-friendly computer host names into IP addresses. For example, www.example.com translates to 208.77.188.166

▪ **Port**

Base Port

Network base port is use for communication between systems. In order for the servers and remote systems to be connected together, the port number must be identically set.

▪ **HTTP Port**

HTTP port use for web-based connection

Encoder Configuration

- **RTSP Port**
  RTSP port used for RTSP-based connection

■ **RTSP Authentication**
  - **If RTSP Authentication is set on the network page, the user should enter the correct user ID and password when any RTSP client is connected.**

■ **SNMP**
  Setup for using SNMP (Simple Network Management Protocol)
  - **SNMP Listen Port:** The port is for connecting external devices when system operates as an SNMP client. SNMP is not used by setting the value to 0.
  - **SNMP Trap Destination IP:** Set the SNMP Trap Destination IP.
  - **SNMP Trap Destination Port:** Set the SNMP Trap Destination Port. SNMP is not used by setting the value to 0.

  > Simple Network Management Protocol (SNMP) is used in network management systems to monitor network-attached devices for conditions that warrant administrative attention. It consists of a set of standards for network management including an application layer protocol, a database schema, and a set of data objects.

■ **Multicast**
  - **Multicast IP**
  The multicast IP address selection range is between 224.0.1.0 and 238.255.255.255. The selection can be used only when media protocol is set to Multicast. The multicast address must be the same for the system to be connected using multicast protocol.

■ **DDNS**
  Select the DDNS (Dynamic DNS) server to use. One of the two servers can be selected.
  - **True DNS:** True DNS service is used in this mode. Systems can be registered on the website for True DNS service: http://ns1.truecam.net. System will get a domain name of xxx.truecam.net style. Please, refer to user guide document for True DNS service.
  - **DynDNS:** DynDNS service is used in this mode. Refer www.dyndns.org for details. ID, Password and Domain name are needed when DynDNS is set.

Encoder Configuration

> Dynamic DNS is a method, protocol, or network service that provides the capability for a networked device, such as a router or computer system using the Internet Protocol Suite, to notify a domain name server to change, in real time (ad-hoc), the active DNS configuration of its configured host names, addresses or other information, stored in DNS.

- **Check IP Disable:** If "Check IP Disable" is selected, IP Server will skip to check its own IP. In Fixed IP mode, the set IP will be registered on DDNS server. In DHCP mode, the Allotted IP will be registered on DDNS server.

■ **Bitrate Control**

- **Flow control mode :** When there are more than one clients connected to an IP camera(or video server) and some of them do not have enough bandwidth to receive encoded stream fully, it is possible to select the way to stream video to clients in Network page

- **Frame Drop Mode:** Frames are dropped on sending routine. Only clients with limited bandwidth are affected by the dropping.

- **Suppression Mode:** Video encoding is suppressed. All clients are affected.

■ **Address Info**

The following network information is displayed (Read only)

- **IP Address:** The server own IP address. This information is useful when the server's IP mode is set to DHCP.

- **Domain Name:** In case the server is registered at DDNS server, the registered domain name is displayed.

- **MAC Address:** Display the MAC address of the server. In case the server is registered at DDNS server, the MAC address is used in DDNS registration.

- **Connecting:** Client IP Addresses that are currently connected to system are listed. (1) Indicates Primary streaming and (0) indicates Secondary streaming.

Encoder Configuration

Serial Port Configuration

Encoder Configuration

■ **Serial Port Type and Configuration**
- ▪ **Serial Port type:** There are two serial ports, one RS-232 and one RS-422/485 available in the VS-101-HDSDI. Select RS-422 or RS-485 in RS-422/485 port
- ▪ **Serial Port Configuration: The serial ports can be configured as follows.**
  Each of the serial ports configurations must be same as the connecting device.

Mode	Selection
Bitrate	2400, 4800, 9600, 19200, 38400, 57600, 115200 bps
Data Bits	5, 6, 7, 8 bits
Parity	NONE, EVEN, ODD bit
Stop Bit	1, 2 bit

■ **PTZ**
- ▪ **PTZ Type:** Select the type of PTZ camera or receiver.
- ▪ **PTZ ID:** Since it is possible to control multiple PTZ cameras or receivers over single control line, each camera or receiver will be assigned with unique ID. Enter PTZ ID of a camera or receiver for control. The ID value range can be between 0 and 255.
- ▪ **PTZ Port:** Select the serial port used for PTZ camera control.
- ▪ **Direct Keyboard Control:** A Keyboard controller can be connected directly to the VS-101-HDSDI to control zoom and focus

■ **Sensor Type**
There are two sensor input ports on the VS-101-HDSDI. Each of the sensor ports can be configured to the following.

Function	Operation
OFF	Not used
NO (Normally Open)	The port is normally open and activated when closed.
NC (Normally Closed)	The port is normally closed and activated when opened.

The function of the sensor port is based on the type of the sensor connected.

■ **Sensor Schedule**
Each sensor port can be enabled or disabled by the day of the week and hour of the day. The Sensor is disabled when the indicated block is colored grey.

Encoder Configuration

Event Configuration

Encoder Configuration

- **Local & Remote Event Configuration**
    - The event configuration page is where the actions for each event type are configured. The Local section configures the actions for events initiated at the local system and activates local devices. The Remote section configures the actions for events from remote (peer) systems.
    - The following table lists the possible actions for events.

Action	Description
Beep	Outputs beep sound using the buzzer in the system
Alarm1/Alarm2	Triggers alarm (relay) port.
E-mail	Sends E-mail to the specified address. AVI file can be attached
FTP	Upload AVI file to a specified FTP server
Preset	Moves the PTZ to associated preset position

    - **The Sensor1 / Sensor2/ Sensor3 / Sensor4.**

      Configure the actions when the sensor is activated. Multiple actions can be set for a single event.

    - **On Video Loss**

      Configure the actions when video input signal is lost. Multiple actions can be set for a single event.

    - **On Motion**

      Configure the actions when motion is detected. Multiple actions can be set for a single event.

    - **On Disconnect**

      Configure the actions when the link(connection) with peer system is disconnected. Multiple actions can be set for a single event.

- **Alarm and Beep activation duration**
    - Set the duration of alarm or beep activation in case of an event. If it is set to continuous, it will remain in the active state until an operator resets it manually.

Encoder Configuration

■ **E-mail Notification**

Specify what information to send, when E-mail is selected as an event action.

- **Server Address:** Enter the address for the e-mail SMTP (server).
- Port: Specify a port for SMTP operation (Port 25 is the default port in SMTP operation. If a different port is configured in the SMTP server, this port needs to be changed accordingly).
- **Sender Address:** Enter an account registered in the SMTP server.
- **ID & password:** When the server requires authentication, ID and Password of an E-mail account need to be entered.
- **Destination address:** Enter Destination address. More than one address can be entered by delimiting comma (,) or semi-colon (;). Destination address can take up to 63 characters.
- **Video Clip Attaching:** A video clip stored at the moment of event can be attached as an AVI or JPEG file format. If using dual Encoding, Primary video or Secondary video (H.264 only) can be selected.

■ **FTP Upload**

Specify the information to upload event information, when FTP is selected as an event action

- **Server Address:** Enter the address of the FTP server to receive video files
- **Port:** Specify a port for FTP operation (Port 21 is the default port in FTP operation. If a different port is configured in the FTP server, this port needs to be changed accordingly.).
- **ID & password:** Enter ID and Password for accessing the FTP server.
- **Upload video:** Primary video and Secondary video (H.264 only), JPEG can be selected as an upload method.
- **Continuous upload:** Continuous upload "on" allows the video image to be transmitted regularly, regardless of occurrence of events.
- **Upload duration:** Specify recording duration of a video clip to be transmitted.
- **Upload interval:** Specify transmission interval.

Recording duration is not included in transmission interval. For example, if upload interval is 60 seconds and upload duration is 20 seconds, a video clip for 20 seconds is transmitted every 80 seconds.

■ **Event Record**

Specify duration of recording video generated by events to send through e-mail or upload through FTP.

- **Pre-event Time:** Specify the duration of recording before an event happens.
- **Post-event Time:** Specify the duration after the event is cleared.
- **Max duration is 30 seconds**

Encoder Configuration

Preset Configuration

Configure up to 15 preset positions. Preset function is not available on some PTZ receivers. Make sure to check if your PTZ receiver supports preset.

- ■ **Preset Configuration**
    - ▪ **Set the PTZ Presets by following the next steps.**
        1. Move cameras to desired view using PTZ control buttons.
        2. Enter Preset name.
        3. Press Set button.
        4. Once all the presets are set, press Save List button.
    - ▪ **Move to Preset Position**
      Select a preset from the Preset List and press the Go To button, the camera will move to the selected preset position.

Encoder Configuration

Recording Configuration

Encoder Configuration

USB Device

A USB hard disk or memory stick can be used, at least 1GB size is recommended.

A device formatted in the EXT3 or FAT32 file system can be used. A disk with either EXT3 or FAT32 file system can be read in a Linux PC. However, only FAT32 files can be read in a Windows PC. When formatting using True Manager the disk will be formatted as EXT3. In order to review files from the device on a Windows PC, you must format the disk in FAT32 using a Windows PC.

> * Less than 4Mbps of video bit rate is recommend when you record and monitor video at the same time since it may cause frame loss.

Disk information and recording setup

After connecting a USB device be sure to restart the system. During booting, the system reads status of the disk and initializes it. Once the initialization of a disk is finished, the status of disk is shown on Record page of web-based setup.

- ■ **Disk Information**

- § **The status of a disk can be checked from the Disk Manage menu of True Manager as well.**
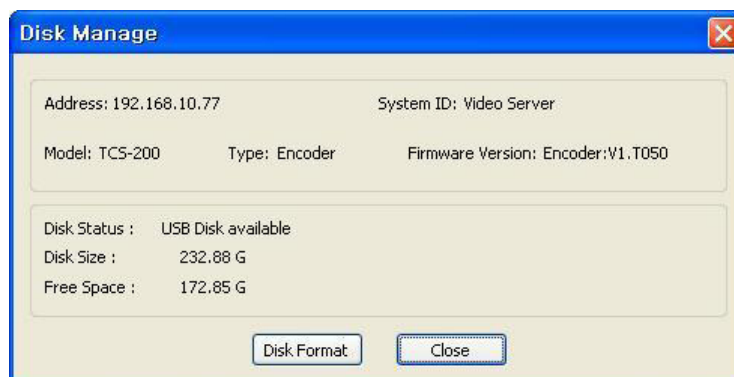
Encoder Configuration

Refer to the chart for checking the status of disk.

Disk status	Description
Disk error detected	Error
No disk	Disk is not connected to the system.
Searching Disk information	Checking the status of disk. Refresh the page and wait until the status is changed.
Mounting and Recovering Disk...	Performing recovery process when disk damage is found. It may take from seconds to minutes for disk recovery.
Disk format needed	Disk is attached, but the type of the file system is unknown or damaged.
Unknown disk type detected	
USB Disk available - (format is recommended)	Disk is available, but formatting is recommended.
USB Disk available	Available to be used for recording
Disk formatting – Start	Disk is being formatted. System should not be turned off during formatting.
Disk formatting – Progressing……	
Disk formatting – Writing inode tables 63/619	
Disk formatting – Creating journal……	
Disk formatting – Writing Superblocks……	
Disk format done, Please wait for reboot.	
Disk removed or in abnormal state	Disk is detached during operation or there is damage on the file system. If it happens while disk is connected, it is recommended to format the disk.

Encoder Configuration

- **General**
  - **Use record - On:** Recording function in enabled when "On" is selected.
    - **Off:** Recording function is disabled when "Off" is selected
  - **Select Video:** Select the video source from either primary video or secondary video
  - **Overwrite:** Selects option when the disk is full. If Overwrite is set to Off, the recording stops automatically when there is less than 100MB free space in the disk. If Overwrite is set to On , recording continues by deleting the oldest data first on disk, maintaining free space of 300MB for normal operation.
  - **Max File Size:** The Max File Size option is for limiting the size of AVI file. If small file size is set, files of small size will be generated while the number of the files will be increased. If recording time is more than 10 minutes, new file will be created even though previous file size is smaller than set max file size.

- **Event Type**
  - **Three recording modes are supported in the VS-101-HDSDI:** Continuous, Event, Disconnect. Event recording, allows event types to be selected as a record start trigger. Selected event types are used to configure the schedule table. Up to 4 event types can be configured and each event type can be a combination of sensor, video loss and motion event.
  - **Pre-event Time:** Specify the duration of recording before an event happens.
  - **Post-event Time:** Specify the duration after the event is cleared

- **Schedule Table**
  - The actual recording mode is determined by the Schedule Table, where recording modes are configured by the day of the week and time of the day.
  - **Each of recording mode configures the recording operation as follows:**
    - Record off : The Record function is disabled and no recording will occur.
    - Continuous : Records continuously
    - Disconnect: Data is recorded when the system loses the connection to its client (Decoder, CMS/NVR) etc. If one of multiple client systems is disconnected, this doesn't happen.
    - Event Type: Initiates Recording when an event configured in the Event Type setting occurs.

Encoder Configuration

Checking status of recording

- **Recording status tally can be shown on the main view page.**

- **Recording status can be also shown in True Manager. When data is being recorded, Record column displays ON sign.**
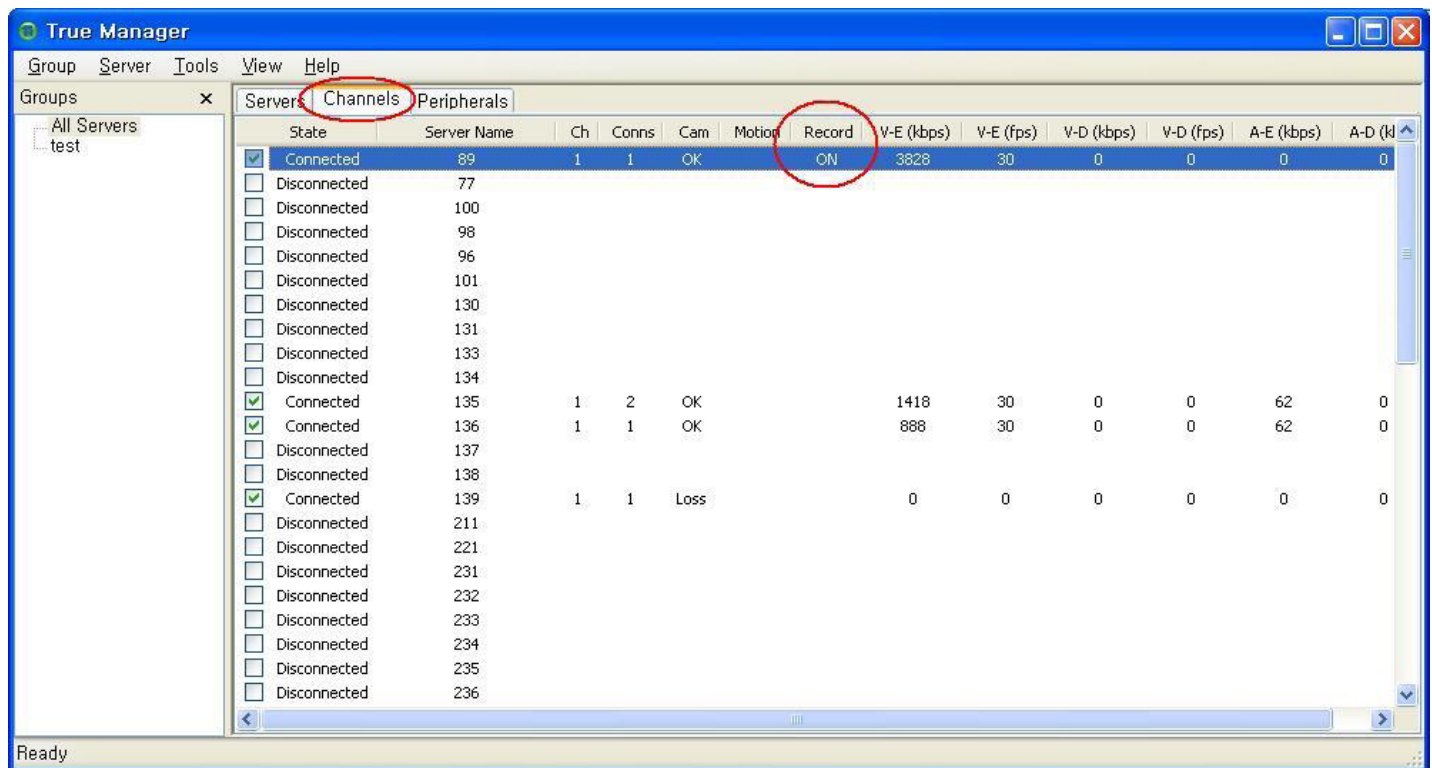
Encoder Configuration

Search and Playback

■ **Recorded File**

- Recorded video and audio data are saved as AVI files on the disk.

- In general, one AVI file is created for an event in case of event-based recording. However, it is possible that data recorded during a series of events happening continuously can be merged to a single AVI file depending on pre/post event time setting. The size of file is limited to 10 ~ 200MB or 10 minutes.

- In case of continuous recording, AVI files are created in series and the size of each is limited to 10 ~ 200MB or 10 minutes.

■ **Search**

- A file currently being recorded doesn't appear until it is completed. In case of Continuous recording, a file will be shown after 10 minutes from the start of recording, for a file is generated every 10 minutes.

- Press Search Page button on the Record setup page. Dates with recording data will be shown as follows.

Search Page

2008_03_03

|◄ ◄ (1) ► ►|

- First, choose the date for search and the list of AVI files will be shown.

- The file name shows the date and time: "Date Begin Time End Time.avi".

Root >> 2008_03_03

Delete

	File Name	Size
☐	080303_165722_165731.avi	1.30 M
☐	080303_165355_165608.avi	22.51 M
☐	080303_165143_165213.avi	4.48 M

|◄ ◄ (1) ► ►|

- Press Root to move back to the page with date list.

Encoder Configuration

■ **Playback**

    ▪ Selecting an AVI file will show a dialog for opening or saving the file.
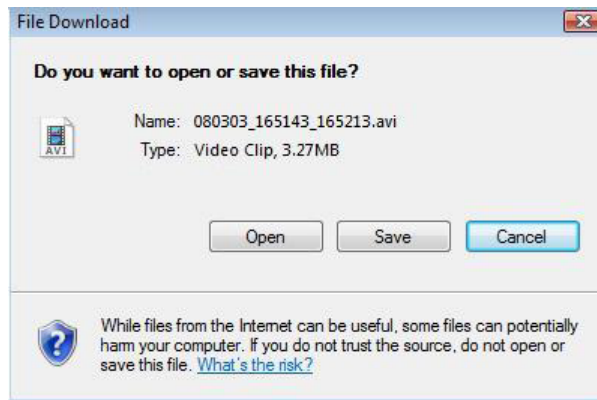
    ▪ Pressing the Save button will Store the file on the PC. The AVI file can then be played with Windows Media Player.
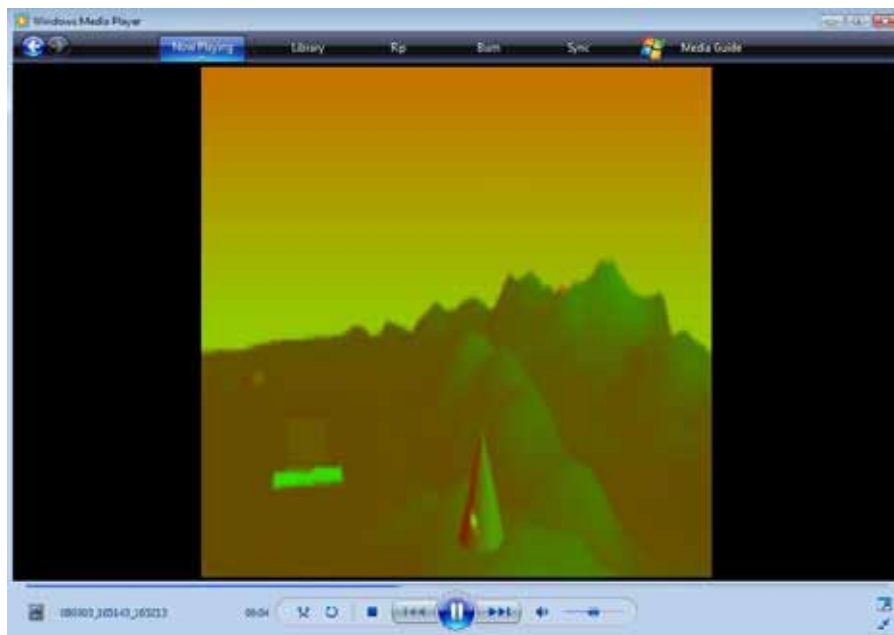
    ▪ If you press Open in the dialog, the file will be downloaded and played automatically with Media Player. Playback will begin after the entire file has downloaded.

    ▪ Other connections through the web will be disabled

Encoder Configuration

- **Deletion**
  - If you want to delete recorded files, select the files by checking the item in front of each file and press Delete button.

  - It is possible to delete multiple files at once.

Formatting Disk

- True Manager is used to format a disk which is connected to the system.
- After connecting True Manager to a system, choose Disk Manage on Tools menu.
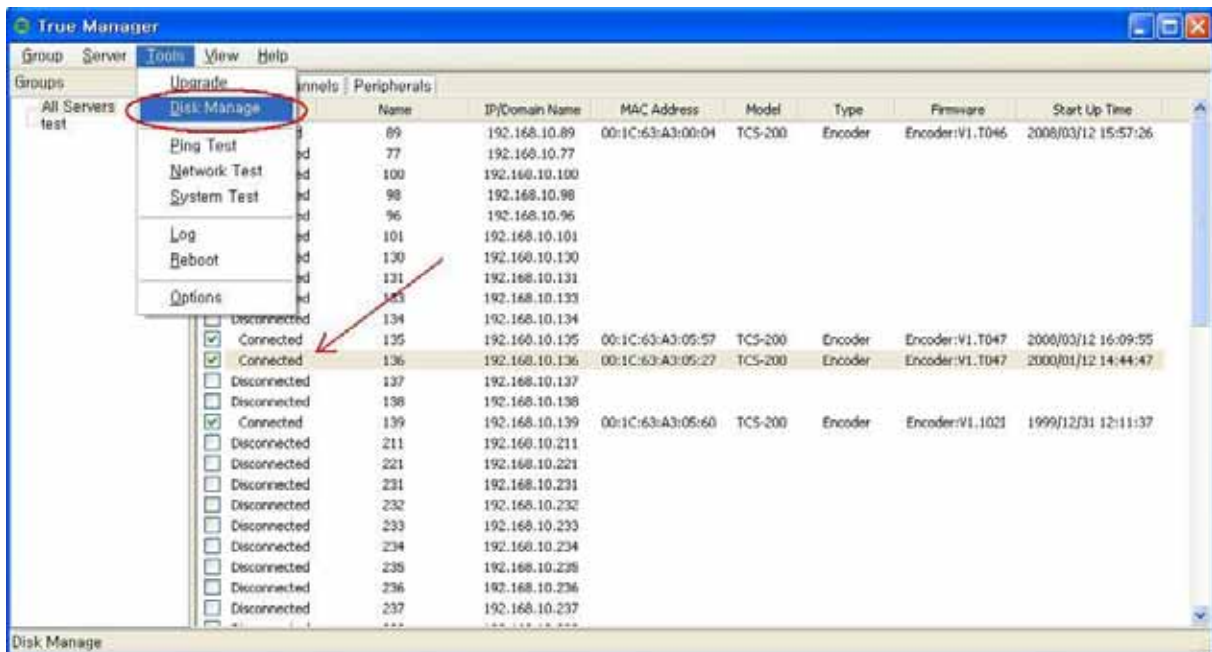
- Check the status of the disk in the dialog and press Disk Format to format the disk.

Encoder Configuration
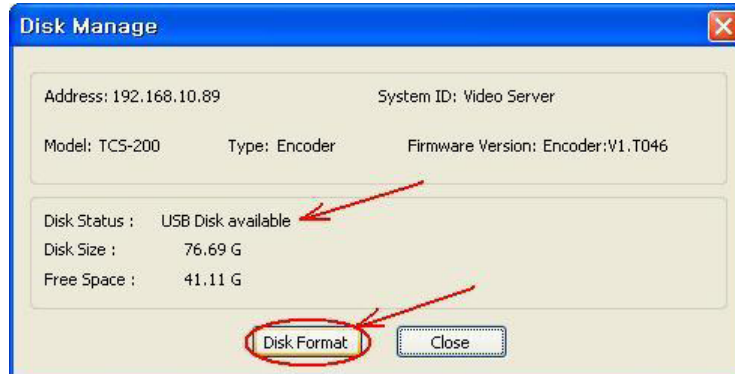
- During formatting a disk, the progress will update on Disk Status item. The system may be rebooted depending on the situation. Once USB Disk available is displayed, it means that formatting is completed successfully.
- Once formatting is started, it is not allowed to cancel. Even if you close Disk Manage dialog, formatting is continued.

Trouble Shooting

- You may cause damage to the file system if you turn off the power to the VS-101-HDSDI or disconnect the USB memory stick or USB HDD while data is being written.
- When using FAT32, recording will not occur if the file system is damaged. If this happens, the disk or memory stick should be reformatted using the PC.
- When using EXT3, if the damage to a file is not serious, it may be recovered automatically. The recovery is executed at initialization of the system. Recording is not performed while recovery is in progress.

Encoder Configuration

User Configuration

- **User List**
    - **The User name and privilege level of a user can be specified. User configuration is allowed only by admin user. Max 16 users can be registered and each user can have one of four privileges.**

Privilege	Allowed Operations	Remarks
Admin	All operations	User id = admin
Manager	All operations except for user configuration	
User	Live viewing and PTZ control	
Guest	Live viewing only	

Encoder Configuration

■ **Add User**

The Add User page appears after the Add button is pressed.

A User ID and password needs to be entered and privilege level needs to be selected.

A User ID and password consist of alphanumeric string of max 15 characters.

▪ **Delete User**

A user is deleted by pressing Delete button.

▪ **Change Password**

Pressing the Modify Password button after selecting a user shows a page for changing password.

In case of changing the admin password, the old password is checked.

Encoder Configuration

- ▪ **Modify Privilege Level**
  Pressing **Modify Privilege** button after selecting a user shows a page for changing the users privilege. It is not allowed to change the privilege level of admin user.

- ■ **Login Policy**
  Skip Login provides for convenient access to the server when authentication is not required. When Skip Login is set to **Enable**, the login step is skipped. The privilege level after login in this way is determined by the setting of **Privilege Level After Login Skipped**.

Decoder Configuration

Decoder Configuration

The Decoder Configuration contains slightly different menu selections from those in the Encoder Configuration. Differences between the two will be explained in the following Decoder Configuration section.

System Configuration

By setting System Mode to Decoder in System configuration, the system will reboot and start to work as a Decoder.

Decoder Configuration

Video Configuration

■ **Output format**

Regardless of the input resolution of the Encoder or IP camera, the Decoder system of VS-101-HDSDI can display the following video formats;

- **Composite NTSC & HDMI 480i (720 x 480)**
- **Composite PAL & HDMI 576i (720 x 576)**
- **HDMI & HD-SDI 720p60 (1280x720)**
- **HDMI & HD-SDI 1080p60 (1920 x 1080)**
- **HDMI & HD-SDI 720p50 (1280 x 720)**
- **HDMI & HD-SDI 1080i50 (1920 x 1080)**

■ **Buffering**

- **You can store a maximum of 30 decoded frames by using the buffer before displaying the output. Displaying stored frames is smoother than displaying in real time. However, displaying stored frames causes a delay because of the buffering process.**

Decoder Configuration

Network Configuration

Network page of Decoder has a section for specifying the remote system to connect.

Decoder Configuration

- **Remote Address**
  - Address of the remote system to connect
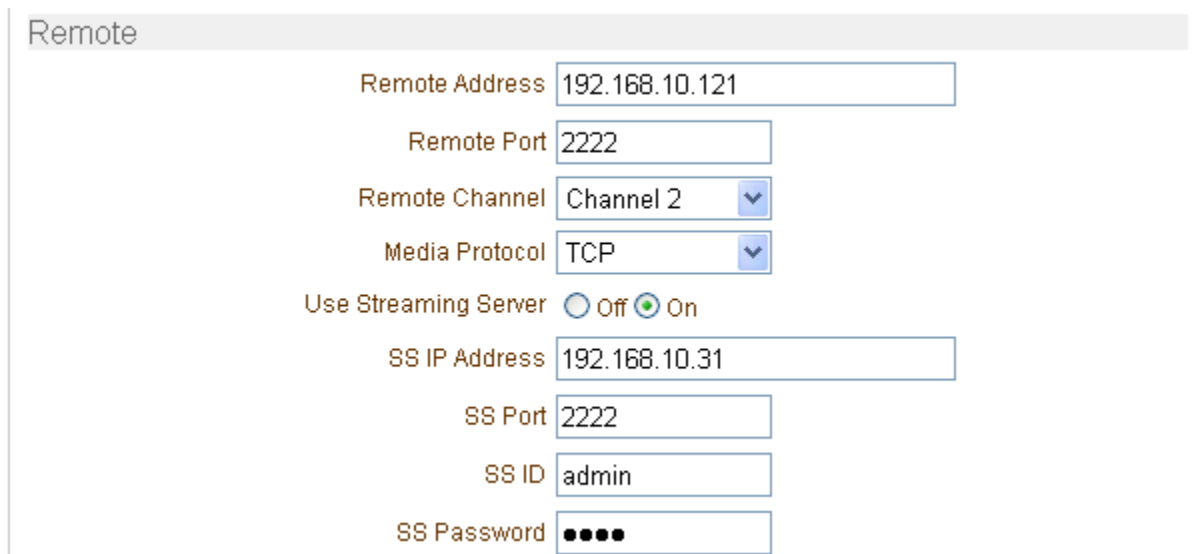
- **Remote Channel**
  - The channel can be selectable when the remote system has more than multiple video channels

- **Media Protocol**
  - Select protocol used for transmission of audio and video data between remote system and decoder.

- **Use Streaming Server**
  - Decoder system has the settings to connect to Encoder or IP Camera via the Streaming Server. To connect to Encoder or IP Camera via Streaming Server, Use **Streaming Server** of **Remote** group in **Network** page should be set to On and information of the **Streaming Server (SS)** needs to be configured appropriately.
  - **SS IP address:** IP address of Streaming server
  - **SS port:** Enter Port number that is set when registering Streaming server.
  - **SS ID:** Enter Streaming Server ID.
  - **SS password:** Enter Streaming Server Password.

Remote

Remote Address	192.168.10.121
Remote Port	2222
Remote Channel	Channel 2
Media Protocol	TCP
Use Streaming Server	○ Off ◉ On
SS IP Address	192.168.10.31
SS Port	2222
SS ID	admin
SS Password	••••

True Manager

True Manager Software

True Manager is a program used for basic configuration, diagnostics and F/W upgrade the VS-101-HDSDI video server. True Manager provides the following features:

- **Finding servers on the LAN and assigning IP address**
- **Monitoring server status: encoding/decoding, serial, sensor etc.**
- **Diagnostic function: PING, network bandwidth measurement, video/audio output, port check, serial port check**
- **F/W upgrade**

Sever Registration and Removal

■ **Server Registration**

In order to manage servers using True manager, the first step is to register the server. The following steps describe the way to register a server.

- **Select Add Server on Server menu.**

- **Enter information for connecting to the server at Add Server dialog.**

True Manager

If the server is registered on DDNS server, the domain name can be used instead of an IP address. When the IP address of the server is not known, it is possible to find the IP address of the server using the IP Discovery function. (Please refer to IP Discovery section).

- Press Add button.

■ **Removal of a server**

A server can be removed using the following steps.

- Select a server to remove on Servers tab. The server should be highlighted in blue.
- Select Remove Server on Server menu.
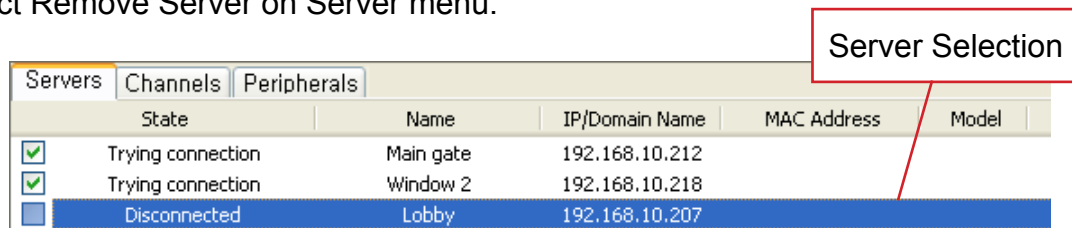
■ **Modification of information for a server**

Information on a server can be modified on the dialog invoked by selecting Modify Server Info on Server menu.

■ **IP Discovery**

With IP Discovery function, all servers on the same LAN where the PC executing True Manager is located can be found. Furthermore, it is possible to easily change the IP address of a server .The IP Discovery dialog is invoked by pressing IP Discovery button on the Add Server dialog, it shows all IP-servers on the same LAN.
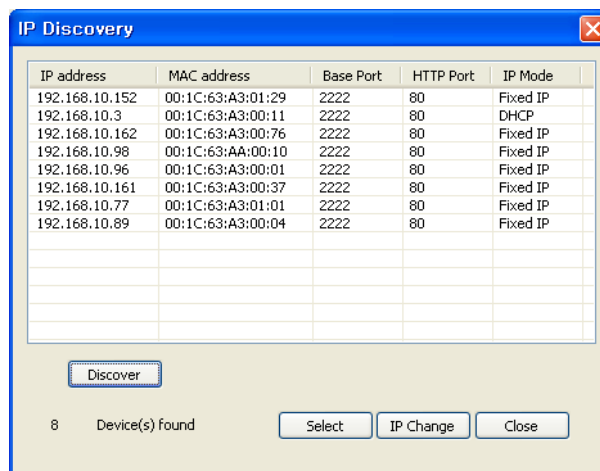
True Manager

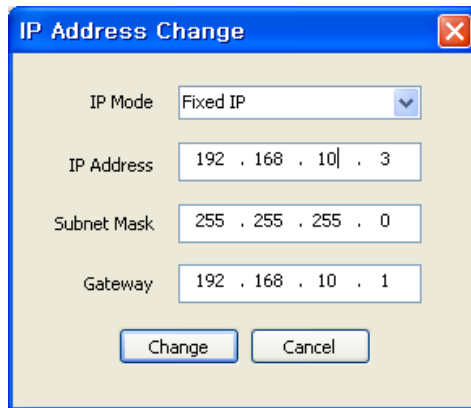If you press Select button after selecting a server, the information on the server is automatically entered on Add Server dialog. Pressing IP Change button after selecting a server invokes a dialog on which IP address of the server can be changed.

It is possible to change the IP address of a server which has IP address of different subnet.

■ **Grouping of servers**

When there are a large numbers of servers, it is convenient to manage servers in several groups. Using Add Group and Remove Group on Group menu, server groups can be created and deleted. Modify Group menu is used to add servers to a group or to remove servers from a group.

True Manager

Server Connection Management

■ **Server connection**

If there is a check in the box on the first column in Servers (or Channels/Peripheral) tab, True Manager tries to connect to that server. If the server is active and the network the server is on is normal, it will be connected immediately and its State will be changed to Connected.

	State	Name	IP/Domain Name	MAC Address	Model	Type	Firmware	Start Up Time
☑	Connected	3	192.168.10.3	00:1C:63:A3:00:11	TCS-200	Encoder	Encoder:V1.TEST	2007/08/11 15:15:53
☐	Disconnected	Main gate	192.168.10.4					
☑	Connected	Ware house	192.168.10.161	00:1C:63:A3:00:37	TCS-200	Encoder	Encoder:V1.101G	2007/08/08 19:57:56

Check box to connect
or disconnect server

If it fails to connect to the server due to server or network failure, State displays Trying connection. As soon as the server or network has recovered, the server will be connected automatically. That is, True Manager periodically retries the connections to servers with the check box checked

■ **Server disconnection**

If the check box is unchecked, the connection to the server is released and State displays Disconnected.

True Manager

Server Status Monitoring

■ **Servers tab – General information**

Servers tab shows general information for a connected server: MAC address, product model, system mode (Type) F/W version and startup time. This information is displayed only for connected servers.

State	Name	IP/Domain Name	MAC Address	Model	Type	Firmware	Start Up Time
☑ Connected	3	192.168.10.3	00:1C:63:A3:00:11	TCS-200	Encoder	Encoder:V1.TEST	2007/08/11 15:15:53
☑ Connected	Main gate	192.168.10.96	00:1C:63:A3:00:01	TCS-200	Encoder	Encoder:V1.TEST	2007/08/11 09:18:55
☑ Connected	Ware house	192.168.10.161	00:1C:63:A3:00:37	TCS-200	Encoder	Encoder:V1.101G	2007/08/08 19:57:56

■ **Channels tab - Monitoring of video/audio channel state**

Channels tab displays the video and audio channel operating parameters of selected servers.

State	Server Name	Ch	Conns	Cam	Motion	V-E (kbps)	V-E (fps)	V-D (kbps)	V-D (fps)	A-E (kbps)	A-D (kbps)
☑ Connected	3	1	2	OK		1090	33	0	0	68	76
☑ Connected	Main gate	1	2	OK		1797	30	0	0	0	0
☑ Connected	Ware house	1	1	OK		970	30	0	0	62	0

Item	Displays
Ch	Channel no.
Conns	Number of clients connected to a server (including True Manager)
Cam	Video loss status
Motion	Motion status
V-E(kbps)	Video encoding bitrate
V-E(fps)	Video encoding framerate
V-D(kbps)	Video decoding bitrate
V-D(fps)	Video decoding framerate
A-E(kbps)	Audio encoding bitrate
A-D(kbps)	Audio decoding bitrate

Depending on the system mode, items which are not relevant will always display 0. For example, V-D(kbps) and V-D(fps) are always 0, if the system mode is Encoder.

■ **Peripherals tab – Monitoring of serial, sensor and relay port**
　▪ **This function is not available in this product.**

True Manager

Network and System Diagnostics

True Manager provides various diagnostic features.

- Connection between two IP-servers, or between IP-server and CMS (Central Monitoring System) is established.
- Video, audio or serial data are not delivered as configured.
- Video and/or audio outputs don't work on selected output port.

■ **Ping test**

Ping Test dialog can be invoked by selecting Ping Test on Tools menu after selecting a server.
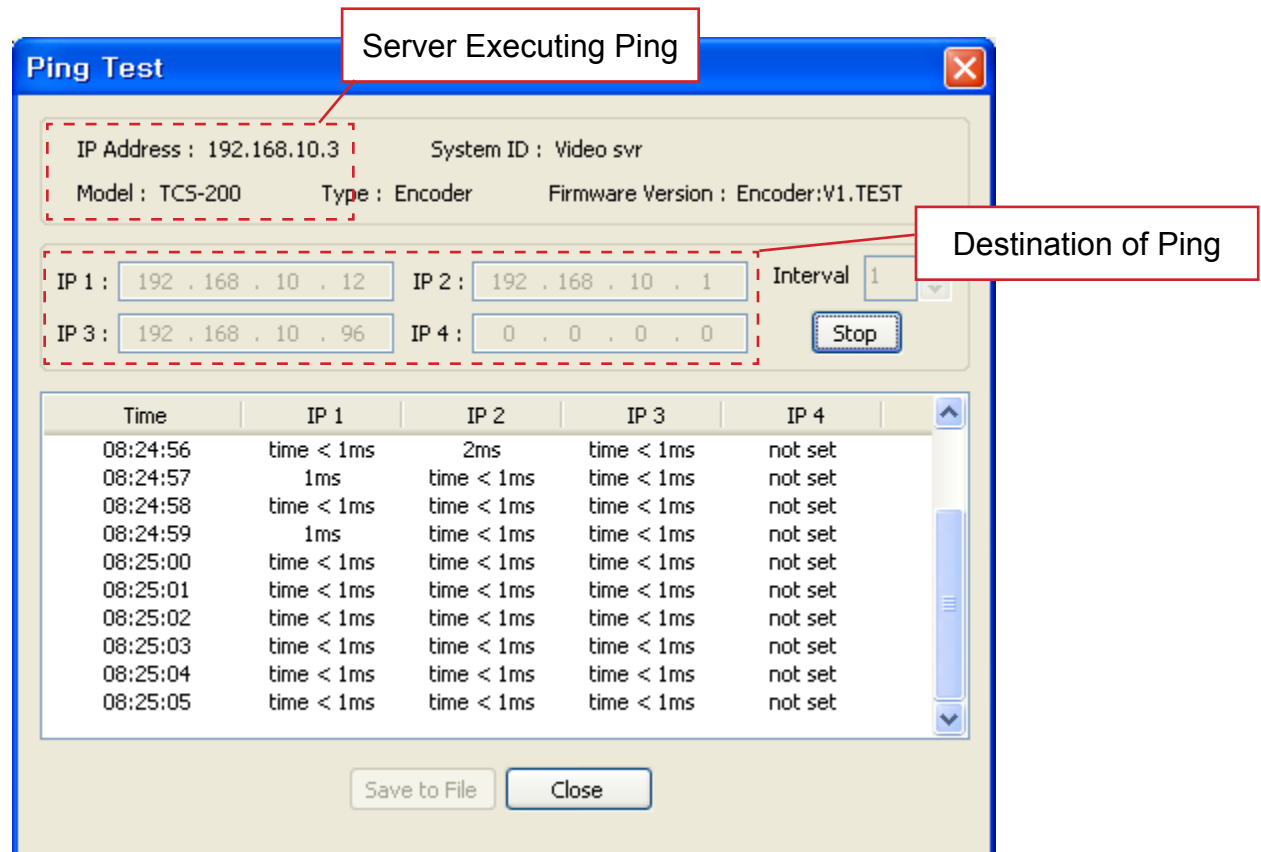
Ping test is useful for checking if one or more remote systems are reachable from a server. Up to 4 systems can be registered as the targets of a Ping test, which makes it possible to identify the hop (segment of network) where network failure may happen. For example, local router, remote router and remote Encoder can be pinged from a Decoder simultaneously.

True Manager

■ **Network test**

Network Test dialog is invoked by selecting Network Test on Tools menu.

Network test can be used for measuring effective bandwidth and/or packet loss rate between a server and PC running True Manager by generating test traffic of constant bitrate. This feature is useful for identifying the reason why video quality appears poorer than expected. TCP protocol can be selected for measuring effective bandwidth, while UDP protocol is appropriate for checking network reliablity.

■ **System test**

Selecting System Test on the Tools menu displays a dialog box which allows you to test system H/W status,video and audio output functions.

True Manager

- ▪ **System Check**

  System Check tests if H/W components are operational. Board ID and MAC address are displayed.

- ▪ **Video Out Check / Display Color Bar**

  It outputs color bars on the video output port. This function works in Decoder or Duplex mode, and is useful for checking if the video output port and external display device is operating normally.

- ▪ **Audio Out Check / Play Audio Clip**

  It plays an audio clip and outputs it to the audio output port. This function is useful for checking if the audio output function of a server and the external audio output devices such as amplifier and speaker are operating normally.

- ▪ **Serial Loopback Test**

  This function is not available in this product

■ Viewing server's log

The activity log of a server can be viewed by selecting Log on the Tools menu.
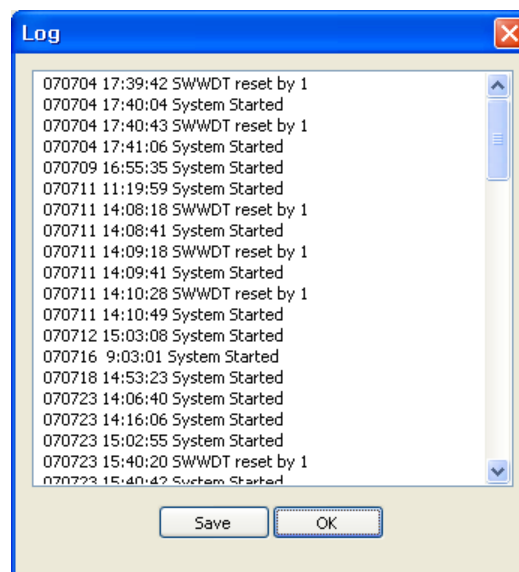
■ Remote rebooting of a server

A server can be rebooted by selecting Reboot on the Tools menu.

True Manager

F/W Upgrade

Selecting Update on the Tools menu displays the Firmware upgrade dialog box.

- **Select a server to upgrade (check the check box in Sel column). More than one server can be upgraded simultaneously.**
- **Select an upgrade file.**
- **Press Upgrade button.**
- **Wait until Progress is changed to Upgrade succeeded.**

> Caution: DO NOT power-off the server while the upgrade is in progress. The server may enter an non-recoverable state

When the network condition is poor, the upgrade procedure may fail. In such a case, please retry the above procedure after the network condition has recovered.

Remove Configuration and Video Monitoring

The VS-101-HDSDI provides both web-based Setup and Video Viewing. If Setup on Server menu is selected, Internet Explorer displays the page for remote setup of the server. If Live View is selected on the menu, Internet Explorer displays the video from the server.

Appendix

Appendix A : Sensor and Alarm Port
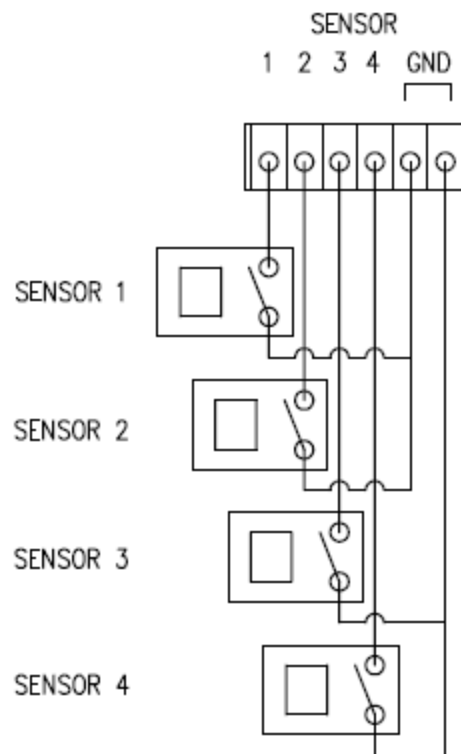
■ **Sensor Port**

    ▪ **Terminal Type**

       - Voltage Rating: 150VAC

       - Current Rating : 2A

       - Color : Red

    ▪ **Sensor Signal Input Type**

       - NO Contact Signals

    ▪ **Connection to External Device**

Appendix

■ **Alarm Port**

- ▪ **Terminal Type**
    - Voltage Rating: 150VAC
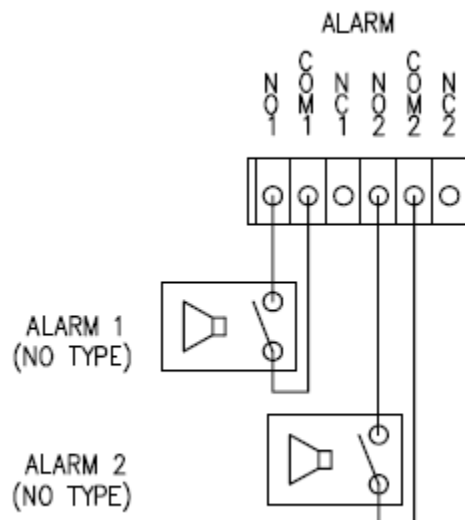   - Current Rating : 2A

- ▪ **Relay Type**
    - Contact Rating : 1A 30VDC
    - Switching Power : Max 30W 62.5VA
    - Switching Voltage : Max 60VDC

- ▪ **Alarm Signal Output Type**
    - NO/NC Contact Signals

- ▪ **Connection to External Device**

Appendix

Appendix B : Serial Port

■ **RS-232 Port**

▪ **Port Type**

-3 PIN

-Pin Arrangement
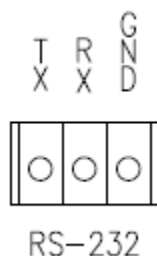
-Pin Description RS-422/485 Port

Pin NO	Pin Name	Description
1	TX	RS232 TX(Transmit)
2	RX	RS232 RX(Receive)
3	GND	Ground

▪ **Port Type**

-4 PIN

-Pin Diagram

-Pin Description

Pin NO	Pin Name	Description
1	RX-	RS422 RX-
2	RX+	RS422 RX+
3	TX-	RS422 TX- or RS485 TRX-
4	TX+	RS422 TX+ or RS485 TRX+ It is selectable by S/W Setup

Troubleshooting

Illegal Connect Error

If an unauthorized connection has been established the system will not function properly. Maintaining the unauthorized connection will result in a message to correct the error condition.

Illegal connect will appear in such conditions as:
1. When Duplex and Encoder are connected
2. When one Duplex connected to more than one Duplex
3. When a Duplex remote connect to set to ON and Other Duplex tries to establish a connection
4. Incompatible Media protocol between two systems
5. Other unauthorized connections

Even if an illegal connect condition occurs, normal operation between systems with authorized connections will not be effected. The color of link LED will change to orange and it blinks and, in case of Decoder or Duplex, 'illegal connect' message will be displayed on screen

Warranty

Marshall Electronics warranties to the first consumer that this V-MD171 LCD monitor will, under normal use, be free from defects in workmanship and materials, when received in its original container, for a period of one year from the purchase date. This warranty is extended to the first consumer only, and proof of purchase is necessary to honor the warranty. If there is no proof of purchase provided with a warranty claim, Marshall Electronics reserves the right not to honor the warranty set forth above. Therefore, labor and parts may be charged to the consumer. This warranty does not apply to the product exterior or cosmetics. Misuse, abnormal handling, alterations or modifications in design or construction void this warranty. It is considered normal for a minimal amount of pixels, not to exceed three, to fail on the periphery of the display active viewing area. Marshall Electronics reserves the option to refuse service for display pixel failure if deemed unobtrusive to effective use of the monitor by our technicians. No sales personnel of the seller or any other person is authorized to make any warranties other than those described above, or to extend the duration of any warranties on behalf of Marshall Electronics, beyond the time period described above. Due to constant effort to improve products and product features, specifications may change without notice.

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